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ORIGINAL ARTICLE

Comparative Analysis of Enhanced Recovery After Cesarean Surgery (ERACS) and Conventional Spinal Anesthesia on Maternal and Neonatal Outcomes: A Retrospective Study

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Abstract

Background: The Caesarean section (CS) rate has increased every year. However, this increase is not entirely due to medical indication. This phenomenon may put bot mothers and newborns at risk of short- and long-term complications associated with CS. Enhanced recovery after caesarean surgery (ERACS) is CS approach that incorporates preoperative, intraoperative, and postoperative. This study compared maternal and neonatal outcomes between ERACS and conventional caesarean delivery.

Methods: A retrospective cohort study was conducted using medical records of caesarean deliveries at Bina Sehat Hospital, Jember (September 2022–August 2023). Fifty ERACS and fifty conventional cases were included. Outcomes were early ambulation (≤12 h), length of stay (≤2 days), and good APGAR score (7–10) at 1 and 5 minutes. Data were analyzed using chi-square test.

Results: Early ambulation (≤12 h) occurred in 38/50 ERACS VS 18/50 conventional cases. Leng of stay ≤2 days occurred in 40/50 ERACS vs 15/50 conventional cases. Good APGAR score in first minute 38/50 ERACS vs 37/50 conventional cases and in fifth minute 48/50 ERACS vs 49/50 conventional cases. The relationship between postoperative ambulation and length of stay is significant.

Discussion: Preoperative, intraoperative, and postoperative modifications can accelerate patient mobilization after caesarean section. In addition, early ambulation improves various body functions related to metabolism. Theses factor has direct impact on postoperative ambulation and shorter length of stay.

Conclusion: ERACS was associated with higher rate of early postoperative mobilization and shorter hospital length of stay compared with conventional caesarean delivery.

Keywords: APGAR score; caesarean section; early ambulation

Introduction

Caesarean section (CS) is a method of delivering a baby through laparotomy and hysterotomy.[1] Globally, the rate of CS has increased from 7% in 1990 to 21% in 2021.[2]

The percentage of births delivered via CS in East Java reached 22.36%, indicating an increase of more than 10% in 2018 compared to 2013.[3] However, thats increase is not entirely due to medical indications, but also to non-medically indicated CS or caesarean on maternal request. This phenomenon may put both mothers and newborns at risk of short and long term complication from CS.[4]

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Several complication of CS in mothers include limited mobility, poor personal hygiene, pain, breastfeeding problems, psychological issues, risk of infection, and hemmorrhage.[5]

On the other hand, CS exposure in newborns is associated with an increased risk of respiratory infections, asthma, and obesity.[6] Therefore, improving the quality of CS is necessary to enhance the quality of life (QoL) of both mothers and newborns.

Enhanced recovery after caesarean surgery (ERACS) is a CS approach that uses specific strategies to optimize maternal health before surgery, during surgery, and after cesarean delivery.[7] The principles of ERACS involve preoperative, intraoperative, and postoperative approaches. In the preoperative phase, patients receive education and follow a restricted preoperative diet.

During the intraoperative phase, the ERACS method utilizes lower doses of anesthesia and balanced fluid management. In the postoperative phase, patients are encouraged to ambulate early, feed early, have catheters removed early, use reduced opioid doses, and breastfeeding.[8] That's an approach designed to enhance recovery and speed up patient discharge.[9] During the COVID-19 pandemic, the ERACS method became widely used because it could improve maternal recovery speed, with less postoperative pain compared to conventional cesarean procedures.[10]

Based on the explanation above, the effectiveness of the ERACS method may influence the QoL of both mothers and newborns. However, studies on this topic remain limited, especially in Jember City. The researcher is interested in evaluating the effectiveness of the ERACS method on early ambulation, length of stay, and APGAR score.

Subjects and Methods

This study is an analytical observational study using a retrospective cohort design. The subjects of this study were mothers and their babies who underwent either conventional CS or ERACS between September 2022 and August 2023 and met the inclusion and exclusion criteria. The chosen sampling technique was simple random sampling, with a total sample of 100 subjects: 50 ERACS and 50 conventional CS.

The inclusion criteria for this study were patients who delivered by ERACS and elective conventional CS methods and were recorded in the medical recorded in the medical records during the period Sep 2022–Aug 2023. The exclusion criteria included patients who required postoperative ICU/HCU care, psychological disorders, malnutrition, extremity abnormalities that could interfere with mobilization, postpartum hemorrhage, and preeclampsia/eclampsia.

Pregnancy and delivery history were not considered in this study. The study was conducted from September to November 2023 by collecting medical record data at Bina Sehat Hospital Jember, after obtaining approval from the Health Research Ethics Committee of the Faculty of Medicine, University of Jember, and permission from Bina Sehat Hospital.

In this study, the ERACS and conventional groups followed a hospital-perioperative protocol. In the ERACS group, patient fasted for 6 h preoperatively and received a carbohydrate drink 2 h before surgery. Spinal anesthesia consisted of 7.5 mg bupivacaine +25 µg fentanyl. Postoperatively, patient was allowed oral fluid within 0–30 minutes and oral feeding 4 hours after surgery. Early mobilization was encouraged, with the patient trained to ambulate independently starting 6 h postoperatively.

Urinary catheters were removed within 24 hours after surgery. In the conventional CS group, patient fasted for 12 hours preoperatively and received spinal anesthesia with 15 mg bupivacaine. Oral intake was permitted only after return of normal bowel sounds (5–35x/minute). Mobilization was initiated 24 hours postoperatively, and urinary catheters were removed within 1–2 days after surgery.

Statistical analysis was performed using SPSS, and the chi-square test was used to compare maternal and neonatal outcomes.

Maternal outcomes included mobilization time and length of hospital stay (LOS). Mobilization time was defined as the the team required for patients to ambulate independently after surgery (≤12 h vs >12 h). Length of hospital stay was defined as duration of hospitalization from delivery until discharge (≤2 days vs >2 days). Neonatal outcomes were assessed using APGAR scores at 1 and 5 minutes. APGAR scores were classified as good (7–10), moderate (4–6), and low (0–3).

Results

The subjects in this study were grouped by maternal and gestational age. The most significant proportion of subjects by maternal age was in the 20–35 year age group (82%), and the majority of gestational ages before delivery falling within 37–40 weeks (78%). The sample characteristics are presented in Table 1.

Based on postoperative ambulation time, categorized as ≤12 hours and >12 hours, 40 mothers who underwent CS with the ERACS method ambulated within ≤12 hours after surgery. Among mothers who underwent conventional CS, only 15 mothers were able to ambulate within ≤12 hours postoperatively. The analysis showed p<0.001, indicating that the type of CS method used during delivery is significantly associated with postoperative ambulation ability. The results of the postoperative ambulation variable measurements are presented in Table 2.

For the variable of length of hospital stay, subjects were categorized into two groups: ≤2 days and >2 days. The results of this study showed that 40 mothers who underwent CS with the ERACS method had a hospital stay of ≤2 days after surgery, whereas among mothers who underwent conventional CS, 15 mothers had a hospital stay of ≤2 days postoperatively. The analysis showed a p <0.001, indicating that the type of CS method used during delivery has a significant relationship with the length of hospital stay after surgery. The results of the measurements for the postoperative length of stay variable are presented in Table 3.

From the results of the study involving 100 samples, at the first minute there were 75 infants with good APGAR scores and 25 infants with moderate APGAR scores. In the ERACS CS group, there were 38 infants with good APGAR scores and 12 with moderate scores, while in the conventional CS group, there were 37 infants with good APGAR scores and 13 with moderate scores. No infants in either group had low APGAR scores. At the fifth minute, 97 infants had good APGAR scores, and only three infants had moderate scores.

The results of the analysis comparing the first-minute APGAR scores between infants delivered by conventional cs and those

Table 1 Participant Characteristic

Characteristic	ERACS (n=50)		Conventional CS (n=50)	
	n	%	n	%
Maternal age				
<20 years	1	1	2	2
20–35 years	42	42	40	40
>35 years	7	7	8	8
Gestational age				
<37 weeks	3	3	3	3
37–40 weeks	41	41	37	37
≥41 weeks	6	6	10	10

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Table 2 The relationship between Postoperative Ambulation and CS Method

CS Method	Postoperative Ambulation		p-value	Relative Risk	Confidence Interval (95%)
	≤12 hour	>2 hours			
	n	n			
Conventional	18	32	<0.001*	0.178	0.075–0.423
ERACS	38	12			

Note: *) chi-square test

Table 3 The Relationship between Length of Stay and CS Method

CS Method	Length of Stay		p-value	Relative risk	Confidence interval (95%)
	≤2 days	>2 days			
	n	n			
Conventional	15	35	<0.001*	0.107	0.430–0.269
ERACS	40	10			

Note: *) chi square test

delivered by ERACS CS are presented in Table 4, and the fifth minute scores are shown in Table 5. The results of the data analysis show that the APGAR scores between infants delivered via conventional CS and those delivered via ERACS CS do not differ significantly, with p=0.817 for the first minute and p=0.558 (p>0.05) for the fifth minute.

Discussion

The results of this study indicate several dominant characteristics found among the research subjects, including maternal age and gestational age. When viewed by age, the study population was dominated by mothers

Table 4 The Relationship between APGAR Score in First Minute with CS Method

CS Method	APGAR score in first minute		p-value
	Good (n=75)	Moderate (n=25)	
Conventional	37	13	0,817*
ERACS	38	12	

Note: *) chi square test

Table 5 The Relationship between APGAR Score in Fifth Minute with CS Method

CS Method	APGAR score in fifth minute		p-value
	Good (n=97)	Moderate (n=3)	
	n	n	
Conventional	49	1	0,5*
ERACS	48	2	

Note: *) fisher exact

aged 20–35 years. Term pregnancies (37–40 weeks) were the most common gestational age category.

This study also shows that more patients who underwent CS with the ERACS method were able to ambulate within ≤12 hours after surgery-38 out of 50 patients-compared to those who underwent conventional CS, where only 18 out of 50 patients were able to do so. A similar pattern was found in the duration of postoperative hospitalization, with 40 out of 50 patients who underwent ERACS CS being discharged within ≤2 days after surgery.

This may occur due to the application of multidrug anesthesia, which uses a combination of several anesthetic agents combined with a low dose of bupivacaine.[11] Several references recommend the use of 12–15 mg of bupivacaine for spinal anesthesia, whereas in the ERACS CS method, the dose used is lower, i.e., less than 10 mg, with the aim of reducing the risk of hypotension in patients.[12]

Mobilization facilitates the expulsion of lochia, supports wound healing, accelerates recovery of the reproductive organs, improves digestive and urinary system function, and enhances blood circulation, which in turn speeds up breast milk production and the elimination of metabolic waste products from the body.[13] Thus, the use of the ERACS CS method has been proven to shorten patients' length of hospital stay.[14] This aligns with the principle of the ERACS method, which offers a faster postoperative recovery period.[15]

In this study, the APGAR scores of infants delivered by conventional CS and ERACS did not show significant differences. This may be due to the similar preoperative management provided to all mothers, particularly preoperative fluid loading. All subjects received preoperative fluid loading to stabilize maternal hemodynamics.[16] If the mother's blood pressure is low, this may affect uteroplacental perfusion and fetal wellbeing, which would subsequently influence the APGAR score.[17]

Preoperative fluid loading counteracts the vasodilation effect caused by spinal anesthesia, thereby maintaining venous return and preventing a drop in blood pressure.[23] Administering preoperative fluid loading according to the patient's needs effectively prevents hypotension during spinal anesthesia.[21]

This study has several limitations. First, the research subjects was limited to only 100 patients and included samples from a single hosptal in Jember Regency. Second, obstetric history were not considered, which may become as potential confounding factors. Third, maternal factors that may influence the anesthesia, such as emotional status and BMI, were not analyzed. Therefore, future studies should focus on larger sample sizes and maternal-related factors to better determine the effectiveness of ERACS.

Conclusion

In this retrospective single-center study, ERACS was associated with a higher rate of early postoperative mobilization (≤12 hours) and a shorter hospital length of stay (≤2 days) compared with the conventional method.

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